

Interactive comment on “Seasonal and Diurnal Dynamics of Subglacial Channels: Observations Beneath an Alpine Glacier” by Ugo Nanni et al.

Anonymous Referee #1

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This manuscript presents a two-year long dataset of seismic measurements together with sliding velocity records made on a glacier in the French Alps, with the aim of characterising the dynamics of subglacial channels over seasonal and diurnal timescales. In my opinion, it is overall well and clearly written, although I found some of the notations confusing in places; the data interpretation is sound and leads to very interesting results. In particular the authors conclude that while channels behave at equilibrium when the discharge is low, they switch to an out-of-equilibrium regime at high discharge, enabling fast ice velocities throughout the summer (e.g., channels do not necessarily have the ability to regulate the ice flow, as anticipated).

I support the publication of the manuscript with minor corrections, and my comments below are aimed at improving clarity further.

-L.53: Interactions between channels and cavities have never been observed. I suggest replacing “observed indirectly” with “inferred”.

-L. 55: similarly, suggest replacing “observed to trigger ” with “linked to”

-L.75: remove parenthesis around Gimbert et al.

-L.121: Should the Manning-Strickler relation read $V = \dots$ (rather than $U = \dots$)?

-L. 140: It would be helpful to have more details on how the authors went from Eqs. 6-7 to Eqs. 10-11, which as stated, are difficult to follow. I suggest adding details in the supplementary material, or as appendix.

-L.174: Suggest replacing “water discharge routing subglacially” with “Subglacial water discharge” ?

-L. 177: By assuming that discharge at the snout is representative of the discharge routed under the seismometers, you are basically assuming that upstream water flow largely coincide with your seismometers locations. This might be correct, but I don't quite see how you can be certain of the location of the upstream subglacial path. For example, have you tried to route the water according to hydraulic potentials?

-L.230-235: A bit hard to follow. Why is P_a set to 0 dB here? Isn't $P_{mea} - P_a$ just P_w , and if so, why not just using P_w ? Perhaps what is confusing here, is that you have two ways of evaluating P_w ; one from the discharge Q , as plotted on Figure 5; and one from subtracting an estimate value of P_a from a measured P_{mea} . Unless I am just missing something, it could be clearer to use different notations, or explain better how each quantity is used in the study (for example, observed vs interpreted). Similarly, the first line in section 5.2 (l.297) refers to the red line shown on Figure 5b as P_{mea} , while the caption indicates that it is P_w . More consistency is needed throughout to increase the clarity of what has been done.

-L. 242: three appropriate metrics? (rather than appropriated?)

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-L. 262: Is P the same as P_{mea} ? If it is, make sure the notations are consistent throughout. If not, explain somewhere how they differ.

-L. 284: The definition of the summer period varies throughout the manuscript. Sometimes it is August to mid-october, sometimes it includes July (e.g. line 364), yet again different in line 385, or 447. . . this needs to be more consistent, if one wants to attribute processes to specific seasons. Or use individual months and refer to a specific period.

-L. 294: typo in “appear to not significantly” – (remove “do”)

-L. 318-319: week day, week end, holidays ?? that was confusing.

-L. 350: delete “presents”

-L. 371: What are the values for R_{ref} and S_{ref} ? (and V_{ref} , Q_{ref} , mentioned elsewhere) – Also, I find the chosen notation of R for R_{ref} and of S for S_{ref} (etc. . .) confusing. As it stands, it is not always clear which variable is being referred to or analysed.

-L. 374: Is V supposed to be V/V_{ref} (as used on Figure 8)?

-L. 409: As I understand, the average basal water pressure is used as representative of pressure conditions in cavities (c.f. L.524). This could be explained here, as it is otherwise unclear how you quantified the latter.

L.462: Again, more clarity needed wrt notations: here, there are two references to Q in the same sentence, one being from Figure 5 showing the measured water discharge, and the other being to the scaled discharge shown on Figure 10.

L.490: “the plain melt season” doesn’t read well. . .

Figure 10: should the Y axis on panel B refer to hydraulic radius?

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